~~the first switch and the second switch are simultaneously turned on is detected.~~

REMARKS

INTRODUCTION

In accordance with the foregoing, claims 1-40 have been amended. Claims 1-40 are pending and under consideration.

Applicants gratefully acknowledge the courtesies extended to applicants' representative during the January 16, 2002 Personal Interview with the Examiner. Applicants' separate record of the substance of the interview is incorporated herein.

Entry and consideration of the following Remarks is proper under 37 C.F.R. §1.116 since the Amendment : (a) places the application in condition for allowance for the reasons discussed herein; (b) does not raise any new issues requiring further search or consideration since the amendments amplify issues previously discussed throughout prosecution; (c) does not present any additional claims; (d) places the application in better form for appeal, should an appeal be necessary. The Amendment is necessary and was not earlier presented because it is made in response to arguments raised in the Final Rejection. Entry of the Amendment is thus, respectfully requested.

DRAWING OBJECTIONS

On page 2, in paragraphs 1 and 2 of the Office Action, the drawings are objected to under 37 C.F.R. 1.83(c) The objections are respectfully traversed.

As noted during the interview, FIG. 1 clearly shows an example of the invention 10, which is later shown in FIG. 2. FIG. 2 clearly shows DC-DC regulator 52, an example of one element of the claimed invention, which is further shown in FIG. 3. Therefore applicants' drawings clearly show the claimed invention and do not require further labeling.

Further, applicants respectfully submit that "Related Art" distinguishes drawings that are not the invention from the invention as required by MPEP 608.02(g). MPEP 608.02(g) specifically states "they may be retained if designated by a legend such as "Prior Art." (Emphasis added) The Examiner may not force applicants to more stringent requirements than required by statute. In this case, even MPEP 608.02(g) only requires a legend "such as" "Prior Art." Therefore applicants may use any legend such as "Prior Art," and is not required to use

any specific terminology. Reconsideration and withdrawal of the objection is respectfully requested.

CLAIM REJECTIONS

On page 2, in paragraph 4 of the Office Action, claims 15-21 are rejected under 35 under 35 U.S.C. §102(b) as being anticipated by Kuriyama et al., U.S. Patent No. 5,933,341. The rejection is respectfully traversed. In order for a rejection under 35 U.S.C. §102(b) to be upheld, the cited reference must teach each and every feature of the claimed invention. Kuriyama et al. does not do so.

As noted during the personal interview, Kuriyama teaches a power converting apparatus where a control means judges whether an abnormal operation is present based upon the power output V_0 detected by the voltage detecting circuit becoming an intermediate electric potential when the switching semiconductor elements 51a and 51b on the three phase alternating circuit are simultaneously turned on. It is only possible to apply this means to a synchronous rectifying circuit. Because in a synchronous rectifying circuit, output voltage V_0 constantly indicates a certain definite power output (a voltage output value). When both switching elements are simultaneously turned on, the output voltage indicates 0 volts. Consequently, it is simple to detect the simultaneous on timing of the switching elements of Kuriyama. However, in the claimed DC-DC converter having a main switch and a synchronous rectifying switch, it is not sufficient to know that the voltage between only the lower arm switching elements has become 0 volts or to detect the direction of the electric current. Therefore, Kuriyama can neither teach nor anticipate "a detection circuit that detects a state that the main switch and the synchronous rectifying switch are simultaneously turned on" as recited in claim 15.

Further, while FIGs. 1 and 4 of Kuriyama bear a superficial resemblance to the claimed invention, the circuit of Kuriyama does not operate as a synchronous rectifying circuit, instead merely detecting a concurrent ON of the transistor. Therefore, Kuriyama can neither teach nor anticipate "a detection circuit that detects a state that the main switch and the synchronous rectifying switch are simultaneously turned on" as recited in claim 15.

Claims 16-21 are allowable as depending on claim 15, as well as for the additional features recited therein. Reconsideration and withdrawal of the rejection of claims 15-21 under 35 USC §102 is respectfully requested.

On page 3, in paragraph 5 of the Office Action, claims 1-14 and 22-35 are rejected under

35 U.S.C. §103(a) as being unpatentable over Kuriyama (U.S. Patent No. 5,933,341) in combination with Weggel (U.S. Patent No. 5,646,837). The rejection is respectfully traversed.

Weggel teaches a circuit for preventing simultaneous turning on of Q_1 and Q_2 by coupling L1 and L2 or L2 and L4. Although Weggel's method is successful to avoid simultaneous turning on of timing, this is a different control method and apparatus from that of the claimed invention. Therefore, Weggel does not solve the deficiencies noted above with respect to Kuriyama. Specifically, neither Kuriyama nor Weggel, either alone or in combination, teaches "a detection circuit that detects when the main switch and the synchronous switch are simultaneously turned on" as recited in claim 1.

Claims 8, 22 and 29 are allowable for reasons similar to those discussed above in relation to claim 1. Claims 2-7, 9-14, 23-28 and 30-35 are allowable as depending on claims 1, 8, 22 and 29 respectively, as well as for the additional features recited therein. Reconsideration and withdrawal of the rejection of claims 1-14 and 22-35 under 35 USC §103(a) is respectfully requested.

On page 4, in paragraph 6 of the Office Action, claims 36-40 are rejected under 35 U.S.C. §103(a) as being unpatentable over Kuriyama et al. in combination with Weggel as applied above, and further in combination with any one of Morgan et al. (U.S. Patent No. 3,376,492 or RE 27,128) or Oba (U.S. Patent No. 6,175,511).

Ooba teaches how to ensure power is supplied in an uninterruptible power supply system, even when the power needed is greater than the power supplied by the AC power input. Ooba neither teaches nor suggests "a detection circuit for detecting a state that said first switch and said second switch are simultaneously turned on" as recited in claim 36. Therefore Ooba does not solve the deficiencies noted above in relation to Kuriyama and Weggel.

Morgan teaches a tapped linear inductor that is applied across a pair of power supply terminals that are adapted to be connected across a source of electric potential. Morgan neither teaches nor suggests "a detection circuit that detects a state that the first switch and the second switch are simultaneously turned on" as recited in claim 36. Therefore Morgan does not solve the deficiencies noted above in relation to Kuriyama and Weggel.

Claims 37-40 are allowable for reasons similar to those discussed above in relation to claim 36, i.e. claim 37 states "a detection circuit that detects when the first switch and the second switch are simultaneously turned on" and claim 40 states "a state that the first switch

and the second switch are simultaneously turned on is detected." Therefore, neither Morgan nor Ooba solves the deficiencies noted above in relation to Kuriyama and Weggel. Therefore, no combination of Kuriyama, Weggel, Morgan and Ooba can either teach or suggest the claimed invention. Reconsideration and withdrawal of the rejection of claims 36-40 under 35 USC §103 is respectfully requested.

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: 4 Apr

By: _____
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please AMEND claims 1-40 as follows:

1. (ONCE AMENDED) A [DC-DC converter having] switching regulator, comprising:

a main switch; [and]

a synchronous [rectifying] switch, [in which said] where the main switch and [said] the synchronous [rectifying] switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted[, said DC-DC converter comprises:]; and

a detection circuit [for detecting a state that said] that detects when the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

2. (ONCE AMENDED) A [DC-DC converter] switching regulator according to claim 1, wherein [said DC-DC converter] the switching regulator further comprises a display unit [for displaying that said] that displays when the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

3. (ONCE AMENDED) A [DC-DC converter] switching regulator according to claim 1, wherein [said DC-DC] the switching regulator further comprises an operation stop circuit [for stopping] that stops a conversion operation of [said DC-DC converter] the switching regulator in a case where [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

4. (ONCE AMENDED) A [DC-DC converter] switching regulator according to claim 1, wherein [said] the detection circuit monitors at least one of [said] the main switch and [said] the synchronous [rectifying] switch.

5. (ONCE AMENDED) A [DC-DC converter] switching regulator according to claim 1, wherein [said] the detection circuit monitors a direction of a current conducting through [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

6. (ONCE AMENDED) A [DC-DC converter] switching regulator according to claim

1, wherein [said] the detection circuit monitors a magnitude of a current conducting through [said] the main switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

7. (ONCE AMENDED) A [DC-DC converter] switching regulator according to claim 1, wherein [said] the detection circuit monitors a driving signal [driving said] that drives the main switch and [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

8. (ONCE AMENDED) A [DC-DC converter control circuit, in which] switching regulator, comprising:

a main switch; [and]

a synchronous [rectifying] switch where the main switch and the synchronous switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted[, said]; and

a [DC-DC converter] switching control circuit [comprises:] , that controls the main switch and the synchronous switch, comprising

a detection circuit [for detecting] that detects a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

9. (ONCE AMENDED) A [DC-DC converter control circuit] switching regulator according to claim 8, wherein [said DC-DC converter control circuit] the switching regulator further comprises detection result output [means for outputting] that outputs a detection result of [said] the detection circuit.

10. (ONCE AMENDED) A [DC-DC converter control circuit] switching regulator according to claim 8, wherein [said DC-DC converter control circuit] the switching regulator further comprises an operation stop circuit [for stopping] that stops a conversion operation of [said DC-DC converter] the switching regulator in a case where [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

11. (ONCE AMENDED) A [DC-DC converter control circuit] switching regulator according to claim 8, wherein [said] the detection circuit monitors at least one of [said] the main

switch and [said] the synchronous [rectifying] switch.

12. (ONCE AMENDED) A [DC-DC converter control circuit] switching regulator according to claim 8, wherein [said] the detection circuit monitors a direction of a current conducting through [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

13. (ONCE AMENDED) A [DC-DC converter control circuit] switching regulator according to claim 8, wherein [said] the detection circuit monitors a magnitude of a current conducting through [said] the main switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

14. (ONCE AMENDED) A [DC-DC converter control circuit] switching regulator according to claim 8, wherein [said] the detection circuit monitors a driving signal [driving said] that drives the main switch and [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

15. (ONCE AMENDED) A monitor circuit for a [DC-DC converter control circuit, in which] switching regulator, comprising:

a main switch; and

a synchronous [rectifying] switch, both of which are alternately turned on so that a voltage of a DC electric power is transformed and outputted, [said] the monitor circuit [comprises:] comprising

a detection circuit [for detecting] that detects a state that [said] the main switch and [said] the synchronous rectifying switch are simultaneously turned on.

16. (ONCE AMENDED) A monitor circuit according to claim 15, wherein [said] the monitor circuit further comprises a detection result output [means for outputting] that outputs a detection result of [said] the detection circuit.

17. (ONCE AMENDED) A monitor circuit according to claim 15, wherein [said] the monitor circuit further comprises an operation stop circuit [for stopping] that stops a conversion

operation of [said DC-DC converter] the switching regulator in a case where [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

18. (ONCE AMENDED) A monitor circuit according to claim 15, wherein [said] the detection circuit monitors at least one of [said] the main switch and [said] the synchronous [rectifying] switch.

19. (ONCE AMENDED) A monitor circuit according to claim 15, wherein [said] the detection circuit monitors a direction of a current conducting through [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

20. (ONCE AMENDED) A monitor circuit according to claim 15, wherein [said] the detection circuit monitors a magnitude of a current conducting through [said] the main switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

21. (ONCE AMENDED) A monitor circuit according to claim 15, wherein [said] the detection circuit monitors a driving signal [driving said] that drives the main switch and [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

22. (ONCE AMENDED) An electronic equipment, comprising:

a [DC-DC converter having] switching regulator;

a main switch; [and]

a synchronous [rectifying] switch, [in which said] where the main switch and [said] the synchronous [rectifying] switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted; and

a detection circuit [for detecting a state that said] that detects when the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on, wherein [said] the electronic equipment is operative with an electronic power from [said DC-DC converter] the switching regulator.

23. (ONCE AMENDED) An electronic equipment according to claim 22, wherein [said] the electronic equipment further comprises a display unit [for displaying] that displays that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

24. (ONCE AMENDED) An electronic equipment according to claim 22, wherein [said] the electronic equipment further comprises an operation stop circuit [for stopping] that stops a conversion operation of [said DC-DC converter] the switching regulator in a case where [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

25. (ONCE AMENDED) An electronic equipment according to claim 22, wherein [said] the detection circuit monitors at least one of [said] the main switch and [said] the synchronous [rectifying] switch.

26. (ONCE AMENDED) An electronic equipment according to claim 22, wherein [said] the detection circuit monitors a direction of a current conducting through [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

27. (ONCE AMENDED) An electronic equipment according to claim 22, wherein [said] the detection circuit monitors a magnitude of a current conducting through [said] the main switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

28. (ONCE AMENDED) An electronic equipment according to claim 22, wherein [said] the detection circuit monitors a driving signal [driving said] that drives the main switch and [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

29. (ONCE AMENDED) A method of monitoring a [DC-DC converter having] switching regulator, comprising:

turning on a main switch; [and]

turning on a synchronous [rectifying] switch, wherein [said] the main switch and [said] the synchronous [rectifying] switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted[,]; and

detecting a state that [said] the main switch and [said] the synchronous rectifying switch are simultaneously turned on is detected.

30. (ONCE AMENDED) A method of monitoring a [DC-DC converter] switching regulator according to claim 29, [wherein it is displayed] further comprising displaying in accordance with [said detection] the detecting, that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

31. (ONCE AMENDED) A method of monitoring a [DC-DC converter] switching regulator according to claim 29, wherein a conversion operation of [said DC-DC converter] the switching regulator is stopped in accordance with [said detection] the detecting.

32. (ONCE AMENDED) A method of monitoring a [DC-DC converter] switching regulator according to claim 29, wherein [said detection] the detecting monitors at least one of [said] the main switch and [said] the synchronous [rectifying] switch.

33. (ONCE AMENDED) A method of monitoring a [DC-DC converter] switching regulator according to claim 29, wherein [said detection] the detecting monitors a direction of a current conducting through [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

34. (ONCE AMENDED) A method of monitoring a [DC-DC converter] switching regulator according to claim 29, wherein [said detection] the detecting monitors a magnitude of a current conducting through [said] the main switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned on.

35. (ONCE AMENDED) A method of monitoring a [DC-DC converter] switching regulator according to claim 29, wherein [said detection] the detecting monitors a driving signal driving [said] the main switch and [said] the synchronous [rectifying] switch to detect a state that [said] the main switch and [said] the synchronous [rectifying] switch are simultaneously turned

on.

36. (ONCE AMENDED) A [DC-DC converter having]switching regulator, comprising:

a first switch; [and]

an inductor which [are]is connected in series [, and] with the first switch;

a second switch disposed between a connecting point of [said] the first switch with [said] the inductor and a ground point, in which [said] the first switch and [said] the second switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted[,said DC-DC converter comprises:]; and

a detection circuit [for detecting] that detects a state that [said] the first switch and [said] the second switch are simultaneously turned on.

37. (ONCE AMENDED) A [DC-DC converter] switching regulator control circuit, [in which] comprising:

a first switch connected in series to an inductor[and];

a second switch disposed between a connecting point of [said] the first switch with [said] the inductor and a ground point where the first switch and the second switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted[, said DC-DC converter control circuit comprises:]; and

a detection circuit [for detecting a state that said] that detects when the first switch and [said] the second switch are simultaneously turned on.

38. (ONCE AMENDED) A monitor circuit for a [DC-DC converter] switching regulator control circuit, [in which] comprising:

a first switch connected in series to an inductor[and];

a second switch disposed between a connecting point of [said] the first switch with [said] the inductor and a ground point where the first switch and the second switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted[, said monitor circuit comprises:]; and

a detection circuit [for detecting a state that said] that detects when the first switch and [said] the second switch are simultaneously turned on.

39. (ONCE AMENDED) An electronic equipment, comprising:

a [DC-DC converter having]switching regulator, comprising

a first switch; [and]

an inductor which [are]is connected in series [, and] with the first switch;

a second switch disposed between a connecting point of [said] the first switch with [said] the inductor and a ground point, in which [said] the first switch and [said] the second switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted; and

a detection circuit [for detecting] that detects a state that [said] the first switch and [said] the second switch are simultaneously turned on, wherein [said] the electronic equipment is operative with an electronic power from [said] the DC-DC converter.

40. (ONCE AMENDED) A method of monitoring a [DC-DC converter having] switching regulator, comprising:

turning on a first switch and an inductor which are connected in series[,]; and

turning on a second switch disposed between a connecting point of [said] the first switch with [said] the inductor and a ground point, wherein [said] the first switch and [said] the second switch are alternately turned on so that a voltage of a DC electric power is transformed and outputted, and a state that [said] the first switch and [said] the second switch are simultaneously turned on is detected.